THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 28

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte RU J. JENG, JAYANT KUMAR, BRAJA K. MANDAL
and SUKANT K. TRIPATHY

_____

Appeal No. 1996-2690
Application 07/967,787

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ON BRIEF

_____

Before JOHN D. SMITH, LIEBERMAN, and ROBINSON, Administrative Patent Judges.

ROBINSON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal under 35 U.S.C. § 134 from the final rejection of claims 1-13, and 37, all of the claims pending in the application.

Claims 1, 2, and 37 are illustrative of the subject matter on appeal and read as follows:

1. A method for forming a crosslinked polymer which exhibits second order nonlinear optical properties, comprising the steps of:

a) combining a host polymer, which includes a second order nonlinear optical component covalently bonded to the host polymer, with a guest crosslinking agent;

b) exposing the combined host polymer and guest crosslinking agent to an electric field to pole the second order nonlinear optical component of the host polymer, whereby the host polymer exhibits second order nonlinear optical properties; and

c) exposing the host polymer and the guest crosslinking agent to electromagnetic radiation to cause the guest crosslinking agent to crosslink the host polymer, thereby forming a crosslinked polymer which exhibits second order nonlinear optical properties.

2. The method of Claim 1 wherein the crosslinking agent will exhibit second order nonlinear optical properties upon exposure to an electric field.

37. A crosslinked polymer which exhibits second order nonlinear optical properties and which is formed by a method, comprising the steps of:

a) combining a host polymer, which includes a second order nonlinear optical component covalently bonded to the host polymer, with a guest crosslinking agent;

b) exposing the combined host polymer and guest crosslinking agent to an electric field to pole the second order nonlinear optical component of the host polymer, whereby the host polymer exhibits second order nonlinear optical properties; and

c) exposing the host polymer and the guest crosslinking agent to electromagnetic radiation to cause the guest crosslinking agent to crosslink the host polymer, thereby forming a crosslinked polymer which exhibits second order nonlinear optical properties.

The references relied upon by the examiner are:

Ulman et al. (Ulman) 4,792,208 Dec. 20, 1988

Reck et al. (Reck), "Crosslinked Epoxy Polymers with Large and Stable Nonlinear Optical Susceptibilities," Nonlinear Optical Properties of Organic Materials II, Vol. 1147, pp. 74-82, 1989.

GROUNDS OF REJECTION

Claims 1-13 and 37 stand rejected under 35 U.S.C. § 112, second paragraph, as failing to particularly point out and distinctly claim the invention.

Claims 1-4, 9-13, and 37 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner relies on Ulman.

Claims 1-13, and 37 stand rejected under 35 U.S.C. § 103. As evidence of obviousness, the examiner relies on Ulman and Reck.

We reverse the rejection under 35 U.S.C. § 112, second paragraph, and the rejection of claims 2-13 under 35 U.S.C. § 103 and affirm the rejection of claims 1 and 37 under 35 U.S.C. § 103.

BACKGROUND

The invention is described at page 3-4 of the specification as being directed to a method of forming crosslinked nonlinear optical (NLO) polymers which exhibit second order nonlinear optical properties and a crosslinked product prepared by the method. The method is stated to include combining a host polymer, having a nonlinear optical component covalently bond thereto, with a crosslinking agent, exposing the mixture to an electric field to pole the nonlinear optical component and then exposing the poled material to electromagnetic radiation to form a crosslinked polymer product.

DISCUSSION

The rejection under 35 U.S.C. § 112, second paragraph

The examiner has rejected claims 5 and 12 as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention. The examiner states that the presence of the terminology "bifunctional" (claim 5) and "difunctionalized" (claim 12) results in the claims being unclear as to what types of functional groups are present on the compounds of these claims. (Answer, page 3). In addition, the examiner has rejected, as a new ground of rejection in the Examiner's Answer, claims 1-13 and 37, as being unclear as to what functional groups are present in the "host polymer" and in the "guest crosslinking agent" to provide crosslinking upon exposure to electromagnetic radiation. (Answer, page 5). The examiner appears concerned that the claims do not recite specific functional groups disclosed in the specification.

We point out that it is well established that "definiteness of the language employed must be analyzed, not in a vacuum, but always in light of the prior art and of the particular application disclosure as it would be interpreted by one possessing the ordinary level of skill in the pertinent art." In re Moore, 439 F.2d 1232, 1235, 169 USPQ 236, 238 (CCPA 1971). We note that the purpose of the second paragraph of Section 112 is to basically insure, with a reasonable degree of particularity, an adequate notification of the metes and bounds of what is being claimed. See In re Hammack, 427 F.2d 1378, 1382, 166 USPQ

204, 208 (CCPA 1970). When viewed in light of this authority, we do not agree with the examiner that the metes and bounds of claims 1-13 and 37 can not be determined when read in light of the specification and as one skilled in this art would interpret them. The examiner has the initial burden of demonstrating indefiniteness of the claims. In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). Here, the examiner has not convincingly demonstrated that one of ordinary skill would not readily recognize the metes and bounds of the rejected claims. It would appear from the examiner's statement of the rejection that there are functional groups which can be reasonably understood as being encompassed by the claimed language. (Answer, pages 3 and 5). That the cited terminology is susceptible to more than one interpretation does not, in and of itself, render the claim indefinite. In our opinion, the examiner has not established that the rejected claims, read in light of the specification and interpreted by one skilled in this art, would not reasonably apprise such a skilled person what is encompassed by the claims. We, therefore, reverse the rejection of claims 1-13 and 37 under 35 U.S.C. § 112, second paragraph.

The rejections under 35 U.S.C. § 103

In rejecting the claims pending in this application under 35 U.S.C. § 103, the examiner has relied upon Ulman, alone, in rejecting claims 1-4, 9-13, and 37, and Ulman in combination with Reck, in rejecting claims 1-13 and 37. Since the rejection of the claims

over Ulman alone is subsumed by the rejection over the combination of Ulman and Reck we will limit our discussion to the rejection over the combination.

Claims 1 and 37:

As with the present claimed invention, Ulman is concerned with the preparation of optical articles exhibiting a high level of second order polarization. Ulman discloses several techniques whereby molecular dipoles can be incorporated into a polymeric binder or matrix to form optical active elements. One such technique comprises (Ulman, column 23, lines 49-58):

> placing the molecular dipole in a transparent polymeric binder, raising the temperature of the binder above its glass transition temperature, externally applying an electric field (also commonly referred to as poling) to align the molecule dipoles in the polymer, and then cooling the optically active element below the glass transition temperature of the polymer with the external field still applied. When the external field is removed, the molecular dipoles will remain in polar alignment.

As noted by the examiner (Answer, page 6), Ulman further teaches that (Column 24, line 23):

> [a]n important variation of this assembly technique is to employ linear polymers having pendant groups which are capable of being aligned by the externally applied electric field.

Similarly, Ulman teaches that (column 24, lines 34-41):

> [l]inear polymers which are capable of supplementing the

> electric field in aligning the molecule dipoles in the externally applied field are characterized by linear (non-crosslinked) backbones, dipolar pendant groups, and a linkage of each dipolar pendant group with the polymer backbone which permits spatial reorientation of the pendant group independently of the orientation of the polymer backbone.

These linear polymers, which include a dipole molecule bound thereto capable of being "poled" when subjected to an external electric field, reasonably appear to correspond to the host polymer of claims 1 and 37. The examiner additionally urges that one or ordinary skill in the art would have been motivated to use the variation outlined above in order to obtain "a more uniform ratio of polymeric binder to molecule dipole, thus avoiding the disadvantages taught by Ulman et al in column 26, lines 3-17." (Answer, page 7).

As we have previously noted, Ulman teaches, as one technique, the binding of dipole molecules which have been subjected to an external electric field wherein the binding polymer is heated above its glass transition temperature followed by cooling below the glass transition temperature while maintaining the electric field. As an alternative to this approach, Ulman teaches the use of linear polymers which can be crosslinked to form a crosslinked binder by the exposure to electromagnetic radiation which converts photosensitive monomers into crosslinked polymers or crosslinked polymers. (column 26, lines 32-63). Ulman additionally states (column 31, lines 22-29):

> To permit crosslinking by exposure to electromagnetic radiation in the near UV and visible portions of the spectrum, there is incorporated in the composition containing the molecular dipole and photosensitive binder precursor one or a combination of compounds acting as initiators. (Emphasis added).

The examiner cites Reck as disclosing (Answer, page 4):

> a method of crosslinking NLO polymers, poling and curing the polymers (pages 76-77). NLO polymers prepared from diepoxides and NLO-amino compounds are taught.

The examiner, additionally, urges that Reck provides (Answer, page 4)

> additional motivation by teaching that the NLO moieties are covalently bonded into a rigid polymeric network and are less likely to undergo relaxation processes that lead to the decay of the noncentrosymmetric alignment of doped or side group NLO polymers.

While Reck does not teach the use of a separate crosslinking agent, it does evidence the use of crosslinkable polymers having NLO moieties attached thereto which are crosslinked while in a poled condition.

Thus, on this record, we agree that the examiner has established a prima facie case of obviousness within the meaning of 35 U.S.C. § 103 with regard to the method of forming a crosslinked polymer, having second order nonlinear optical properties, where a host polymer having the nonlinear optical component covalently bonded thereto is combined with a crosslinking agent, the combination subjected to an electric field to pole the nonlinear optical component of the host polymer and exposing the combination to

electromagnetic radiation to cause the crosslinking of the host polymer and thus form a crosslinked polymer which exhibits second order nonlinear optical properties as well as the resulting produce as claimed. The references, and particularly Ulman, discloses the use of the required components, the use of an electric field to obtain poling and the use of electromagnetic radiation to crosslink the nonlinear polymer binder to form the resulting crosslinked product having the prescribed properties. Where, as here, a prima facie case of obviousness has been established, the burden of going forward shifts to the appellants. In re Piasecki, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984), In re Rinehart, 531 F.2d 1048, 1052, 189 USPQ 143, 147, (CCPA 1976).

Appellants initial argue that (Principal Brief, page 7):

> [t]here is no disclosure that the binder precursors can themselves contain a nonlinear optical component as part of a polymer backbone or side chain. . . . There is also no disclosure in Ulman et al. that a host polymer which contains a nonlinear optical component, can be crosslinked by a distinct crosslinking agent, while the nonlinear optical component of the host polymer is poled.

This argument is not persuasive since Ulman does disclose the linear polymers, dipolar pendant groups, and a linkage of each dipolar pendant group with the linear polymer backbone (Column 24, lines 34-41). Further, we note the discussion at column 26, lines 38-51, where Ulman distinguishes the "linear polymers employed as binder precursors are to be distinguished from the linear polymers previously employed as

binders in the art." Similarly, Ulman also describes the poling of the polymer binding precursor prior to crosslinking (column 26, lines 32-34).

Appellants, additionally, argue that (Principal Brief, page 8):

> [t]here is no disclosure or suggestion in Ulman et al. of making the combination of host polymer and guest crosslinking agent employed in Appellants' claimed method.

We do not agree. Ulman discloses various polymer materials, including those having NLO components attached there to in a process intended to yield a product of the type claimed. As we have discussed above, one such technique involves the use of a crosslinking agent, in the presence of the linear polymer where the combination is subjected to an electric field to pole the combination and then subjecting this poled combination to electromagnetic radiation in order to effect crosslinking of the combination. The use of a particular linear polymer in this process has not been shown to be critical. Further, Ulman teaches the advantage of using the linear polymer having the NLO bound thereto. (Column 24, lines 27-32). This is sufficient, in our opinion, to have reasonably suggested, to those of ordinary skill in this art, the use of a polymer of the type claimed, in combination with a crosslinking agent, in a process where the combination is subjected to an electric field and subsequently crosslinked in a manner to arrive at a crosslinked product having the desired second order nonlinear optical properties which is Unman intended product.

To the extent that appellants argue that Ulman does not specifically disclose crosslinking a polymer having the nonlinear optical moiety bond thereto, we note that Ulman suggests the use of such polymers in this type of process and Reck specifically teaches the use of such polymers which are crosslinked to form second order nonlinear optical polymers as claimed.

Thus, having weighed appellants' arguments and evidence against the evidence in favor of unpatentability, we agree with the examiner's determination that Ulman taken in view of Reck is sufficient to establish a prima facie case of unpatentability as to the claimed subject matter which is not overcome by persuasive arguments or evidence. We, therefore, affirm the rejection of claims 1 and 37 under 35 U.S.C. § 103.

Claims 2-13:

Claim 2, and those claims directly or indirectly dependent on claim 2, differ from claims 1 and 37 in providing that the crosslinking agent exhibits second order nonlinear optical properties upon exposure to an electric field. In separately addressing claim 2, the examiner states (Answer, page 8):

> With respect to claims 2-4, Ulman et al disclose molecular dipoles with at least one, preferably two, crosslinking group in column 37, line 53 to column 41, line 5. If these molecular dipoles were covalently bonded to a polymer to provide the polymeric alternative taught by Ulman et al, polymers having polymerizable groups would be expected to result.

We find no suggestion in Ulman and the examiner points to no evidence which

reasonably suggests the use of a crosslinking agent in a process of the type claimed wherein the crosslinking agent would be expected to exhibit second order nonlinear optical properties upon exposure to an electric field. The molecules referenced by the examiner are not disclosed as being useful as separate and distinct crosslinking agents in a process wherein a host polymer has a second order nonlinear optical component covalently bonded thereto. In fact, Ulman suggests that the use of such molecules "permits a separate binder to be eliminated or employed on a (sic, an) optional basis" (Column 37, lines 60-61). That the disclosure of Ulman could conceivably be modified to arrive at the claimed invention is insufficient to establish a prima facie case of unpatentability absent some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the modification required. That knowledge cannot come from the appellant's invention itself. Diversitech Corp. v. Century Steps, Inc., 850 F.2d 675, 678-79, 7 USPQ2d 1315, 1318 (Fed. Cir. 1988); In re Geiger, 815 F.2d 686, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). The extent to which such suggestion must be explicit in, or may be fairly inferred from, the references is decided on the facts of each case, in light of the prior art and its relationship to the invention. It is impermissible, however, simply to engage in a hindsight reconstruction of the claimed inventions using appellants' claimed invention as a template and selecting elements from

references to fill the gaps. In re Gorman, 933 F.2d 983, 986-87, 18 USPQ2d 1885, 1888 (Fed. Cir. 1991).

On the record before us, we find that the examiner has failed to establish that it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute the crosslinking agent required by claim 2 into those processes taught by Ulman in a manner to arrive at the claimed process. Reck fails to provide that missing suggestion or reason to so modify Ulman. Where the examiner fails to establish a prima facie case, the rejection is improper and will be overturned. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir.1988). Therefore, the rejection of claims 2-13 under 35 U.S.C. § 103 is reversed.

CONCLUSION

The examiner's rejection of claims 1-13 and 37 under 35 U.S.C. § 112, second paragraph, is reversed**.**

The rejection of claims 2-13 under 35 U.S.C. § 103 as obvious over Ulman alone, or Ulman taken in combination with Reck is reversed.

The rejection of claims 1 and 37 under 35 U.S.C. § 103 as obvious over Ulman taken in combination with Reck is affirmed.

No time period for taking any subsequent action in connection with this appeal may

be extended under 37 CFR

§ 1.136(a).

AFFIRMED-IN-PART

John D. Smith Administrative Patent Judge	)	
Paul Lieberman Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
Douglas W. Robinson Administrative Patent Judge	)	

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